"PRESSORS"

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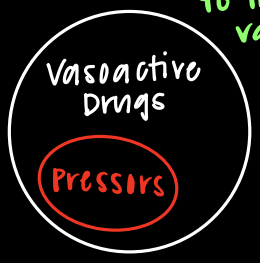
↳ Activate Adrenergic Receptors to increase peripheral vasoconstriction

* GOAL: Increase tissue perfusion, especially in end organs who otherwise won't have enough perfusion to function adequately. *



Using pressors expects the following results:
- ↑SVR (systemic vascular resistance)
  - Normal Reference Range: 600-1200
  - Measurement of AFTERLOAD

(Stroke Volume)
CO = ↑HR × SV
SV: Preload (temporary), Contractility, *Afterload (SVR)

Actions of Vasopressors

Alpha (α) Receptors
* α_1 Receptors - smooth muscle contraction
α_2 Receptors

Beta (β) Receptors
* β_1 Receptors (Heart) - increase chronotropy and ionotropy
β_2 Receptors (Lungs) - smooth muscle relaxation in lungs
β_3 Receptors

V_1 Receptors - activated by vasopressin and causes smooth muscle contraction

AT II Receptors - activated by angiotensin II and causes peripheral vessel constriction

Agonist Drug: fully activates the receptor to which its bound

Antagonist Drug: does not activate the receptor and can block the effects of the other agonist

VASSOPRESSORS

Norepinephrine (Levophed)
- Usually FIRST-LINE pressor
- Primarily α_1 agonist, has some β_1 agonist effects
  - causes relatively equal veno and arterial constriction
    ↳ Extravasation could cause tissue necrosis and/or limb ischemia
- Dosing/Concentration
  - Usually 4mg/250mL (can come in 2, 8, or 16 mg as well)
  - Dose per literature = 1-12 mcg/min, but can vary in diff. hospitals
- Has rapid onset (~1 minute)
- can titrate every 3-5 minutes

Phenylephrine (Neosynephrine)
- Pure α receptor agonist which can cause a baroreceptor mediated bradycardia which could affect CO
- causes relatively equal veno and arterial constriction
  ↳ Extravasation could cause tissue necrosis and/or limb ischemia
- Dosing/Concentration
  - Conc. usually 40mg/250mL
  - Standard dose: 50-200 mcg/min
- Rapid Onset (~1 minute)

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- Can titrate every 3-5 minutes

Vasopressin

- Usually 2nd line in pts who are resistant to catacholamine pressors (i.e. Norepi)
- Impacts the Arginine-Vasopressin System (AVS) to ↑BP
- Acts as a V_1 receptor site agonist
  - Also helps w/ water reabsorption in kidneys, thus helping ↑BP
- Dosing/concentration
  - Conc. usually 20 Units/100 mL
  - Dose: 0.01-0.04 units/min (per pharm, 0.03 units/min)
- Onset is 5-15 min.
- NON-TITRATABLE!

Epinephrine

- Used when other meds have failed
- Nonselective Adrenergic Agonist (acts on α_1, α_2, β_1, β_2, and β_3)
- Larger doses select for α_1 and α_2 receptors
- Dosing/concentration
  - Conc. usually 1mg/250 mL
  - Dose: 1-10 mcg/min
- Onset usu 1-2 min
- Titrate every 5-10 min

Dopamine

- Dose dependent effects:
  - α or β agonist depending on dose
- Dosing/concentration
  - Conc. usu 400mg/250 mL
  - Dose: 2-20 mcg/kg/min
    - 0.5-2 (Renal dose)
    - 5-10 (Ionotropic Effect, β agonist)
    - 10-20 (Adrenergic Effect; α agonist)
- Onset usually 5 minutes
- Titrate every 10 minutes

	α	β_1	β_2	SVR	HR	Ionotropy
Norepinephrine (Levophed)	↑↑↑	↑	⊘	↑↑↑↑	↑↑	↑
Phenylephrine (Neosynephrine)	↑↑↑	⊘	⊘	↑↑↑↑	↓	⊘
Vasopressin V_1	⊘	⊘	⊘	↑↑↑↑	⊘	⊘
Epinephrine	↑↑↑	↑↑	↑	↑↑↑↑	↑↑↑	↑↑↑
Dopamine	↑↑↑	↑↑↑	↑	↑↑↑	↑↑↑	↑↑
Angiotensin II (Giapreza) ATII	⊘	⊘	⊘	↑↑	⊘	⊘

Angiotensin II (Giapreza)

- Synthetic peptide of normal ATII found in our bodies
- New as of 2017
- Activates RASS system; specifically ATII receptors which causes vasoconstriction
  - primarily acts on ARTERIAL vasoconstriction
- ARBs can reduce effect of this
- Dosing/concentration
  - concentrations:
    - High conc. → 2.5 mg/250 mL
    - Standard conc. → 2.5 mg/500 mL
  - Dose: 20-80 ng/kg/min OR 0.02-0.08 mcg/kg/min)
- Onset ~5 minutes
- Titrate every 5 minutes

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CARDIOGENIC SHOCK

Dobutamine (Dobutrex)

- Stimulates β_1 receptors → Increased ionotropic/chronotropic activity
  - Minor β_2 activity
- Indications: Cardiogenic shock
  Low CI, Elevated PCWP
- ADRs:
  - Tachycardia
  - Arrhythmias
  - Increased MVO_2 (Myocardial Oxygen Demand)
- Dosing/Concentration
  - 2-20 mcg/kg/min IV
  - MAX: 40 mcg/kg/min
  - Concentration → 1000mg/250mL in 5% dextrose IV
    OR 250mg/20mL IV

Milrenone (Primacor)

- MOA: Inhibition of phosphodiesterase, reducing the degredation of cAMP leading to enhanced contractility
- Positive ionotrope and venodilator
- Indications similar to Dobutamine → Theoretically better in pts on Beta-Blockers
- ADRs:
  - Hypotension
  - Arrhythmias
  - Thrombocytopenia
- Dosing/Concentration
  - Dose: 0.375 - 0.75 mcg/kg/min IV
  - MAX: 0.75 mcg/kg/min
  - Concentration: 1mg/mL IV solution

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CARDIOGENIC SHOCK DEFINITIONS

- SBP < 80 or 90 mmHg
- CI < 2.2 l/min/m^2
- PCWP > 18 mmHg

Hemodynamic Goals of Tailored Therapy

- MAP > 60
- CI > 2.2
- PCWP 14-18 mm Hg
- CVP 8-12 mm Hg
- SVR < 800

CARDIOGENIC SHOCK SUBSETS

SUBSET I

- Lowest mortality subset
- Normal PCWP and CI (warm and dry)
- Tx: Optimize chronic oral therapy
  - ACEi, BB, Diuretics

SUBSET II

- Elevated PCWP & normal CI (warm and wet)
- Tx: Reduce preload (PCWP) w/ loop diuretics
  - Nitroglycerin for pulm. edema

SUBSET III

- Normal PCWP & Low CI (cool and dry)
- CM: s/sx of hypoperfusion
- Tx:
  - Fluids
  - Dobutamine, Milrenone
  - Nitroglycerin can be considered if normotensive

SUBSET IV

- HIGHEST mortality subset
- Elevated PCWP & Low CI (cold and wet)
- Tx:
  - Vasopressors (Dopamine) if MAP <50
  - Diuretics
  - Pulmonary vasodilator w/ NTG

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